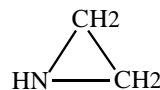


## ETHYLENE IMINE

Ethylene imine is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 151-56-4

Molecular Formula:  $C_2H_5N$



Ethylene imine is a clear, colorless liquid with an intense odor of ammonia. It is soluble in alcohol and miscible in water and most organic solvents (Merck, 1983).

### Physical Properties of Ethylene Imine

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Synonyms: aziridine; ethyleneimine; azacyclopropane; aminoethylene

Molecular Weight:	43.07
Boiling Point:	56-57 °C
Melting Point:	-78 °C
Flash Point:	-11.1 °C (12 °F)
Vapor Density:	1.48 (air = 1)
Density/Specific Gravity:	0.8321 at 24/4 °C (water = 1)
Vapor Pressure:	160 mm Hg at 20 °C
Log Octanol/Water Partition Coefficient:	8.04
Conversion Factor:	1 ppm = 1.76 mg/m <sup>3</sup>

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(Merck, 1983; HSDB, 1991; Sax, 1989; U.S. EPA, 1994a)

## SOURCES AND EMISSIONS

### A. Sources

Ethylene imine is used as a flocculating agent in water treatment, as a coating agent, an adhesive, and a chemical intermediate (HSDB, 1991).

### B. Emissions

No emissions of ethylene imine from stationary sources in California were reported, based on data obtained from the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

### C. Natural Occurrence

Ethylene imine is not known to occur as a natural product (HSDB, 1991).

## **AMBIENT CONCENTRATIONS**

No Air Resources Board data exist for ambient measurements of ethylene imine.

## **INDOOR SOURCES AND CONCENTRATIONS**

No information about the indoor sources and concentrations of ethylene imine was found in the readily-available literature.

## **ATMOSPHERIC PERSISTENCE**

In the troposphere, ethylene imine is expected to react with the hydroxyl (OH) radical, and also possibly with gaseous nitric acid. The calculated half-life and lifetime of ethylene imine due to the reaction with the OH radical are 1.6 days and 2.4 days, respectively (Atkinson, 1995).

## **AB 2588 RISK ASSESSMENT INFORMATION**

Ethylene imine emissions are not reported from stationary sources in California under the AB 2588 program. It is also not listed in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines as having health values (cancer or non-cancer) for use in risk assessments (CAPCOA, 1993).

## **HEALTH EFFECTS**

Probable routes of human exposure to ethylene imine are inhalation and dermal contact.

Non-Cancer: Ethylene imine is extremely irritating to the eyes, skin, and respiratory tract and is a blistering agent. Respiratory effects may be delayed for several hours. Direct eye exposure may result in permanent corneal opacity. Renal damage and hematological effects have been seen in humans. Chronic exposure in humans and animals has been reported to cause effects on the blood (U.S. EPA, 1994a).

The United States Environmental Protection Agency (U.S. EPA) has not established a Reference Concentration (RfC) or an oral Reference Dose (RfD) for ethylene imine (U.S. EPA, 1994a).

No information is available on the adverse developmental or reproductive effects of ethylene imine in humans or animals (U.S. EPA, 1994a).

Cancer: No information is available on the carcinogenic effects of ethylene imine in humans. An increased incidence of tumors has been observed in rodents exposed to ethylene imine by

gavage or subcutaneous injection. The U.S. EPA has classified ethylene imine in Group B2: Probable human carcinogen (U.S. EPA, 1994a). The International Agency for Research on Cancer has classified ethylene imine in Group 3: Not classifiable as to carcinogenicity in humans, based on no adequate data in humans and limited evidence in animals (IARC, 1987a).

The State of California has determined under Proposition 65 that ethylene imine is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is  $1.9 \times 10^{-2}$  (microgram per cubic meter)<sup>-1</sup> (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to 1 microgram per cubic meter of ethylene imine is estimated to be no greater than 19,000 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is 65 (milligram per kilogram per day)<sup>-1</sup> (OEHHA, 1994).

